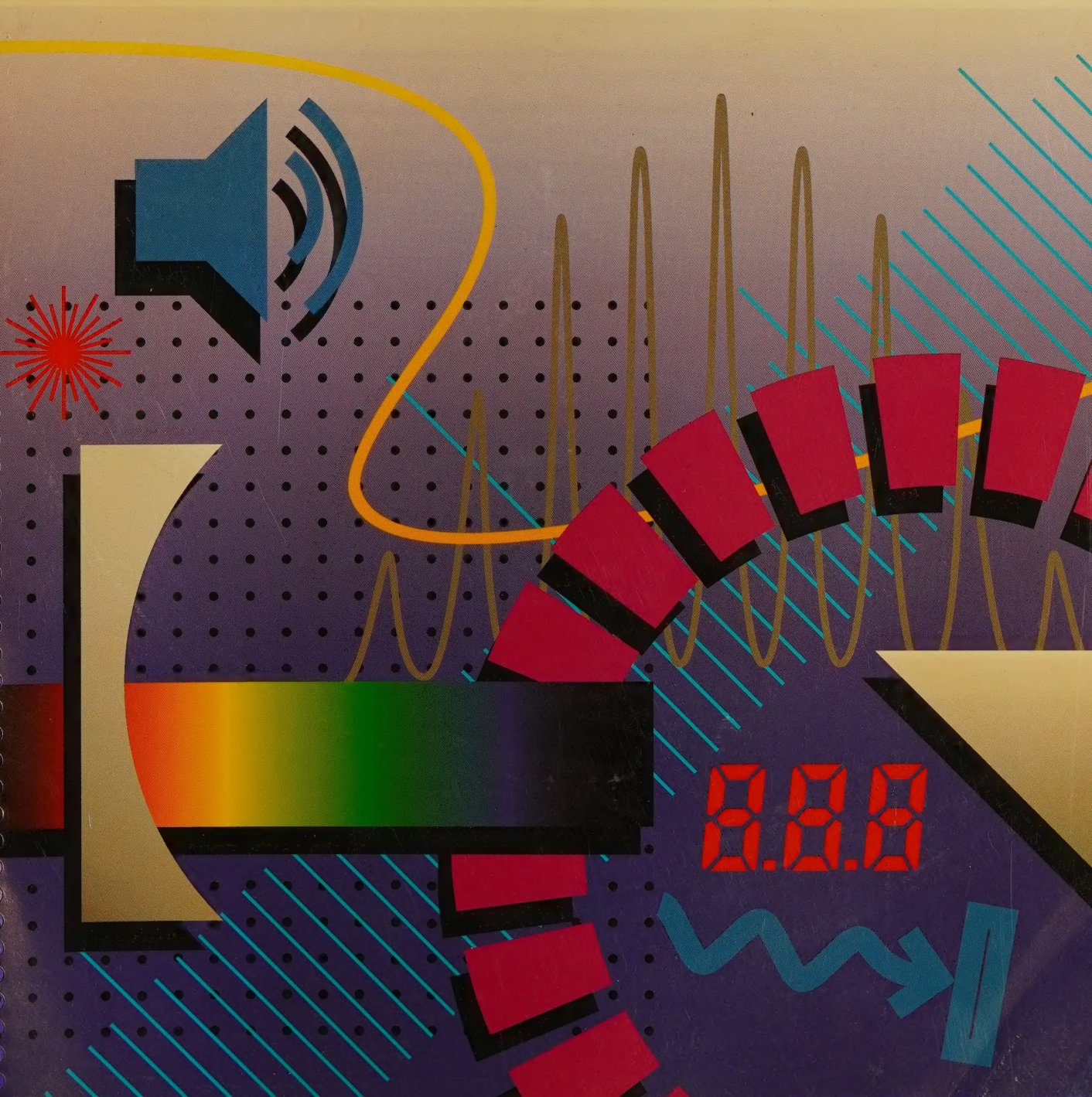
Newport

Vibration Isolated Workstation Instruction Manual



Warranty

Newport Corporation warrants this product to be free from defects in material and workmanship for a period of one year from the date of shipment. In addition, the laminated honeycomb tops have an extended five year warranty against delamination of the skins under normal use and proper handling. If found to be defective during the warranty period, the product will either be repaired or replaced at Newport's option.

To exercise this warranty, write or call your local Newport representative or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions.

Repaired or replaced products are warranted for the balance of the original warranty period or 90 days, whichever is longer.

This warranty does not apply to defects resulting from modifications or improper use of the system or its component parts.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. Newport Corporation shall not be liable for any indirect, special, or consequential damages.

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Irvine, California, U.S.A.
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Specifications

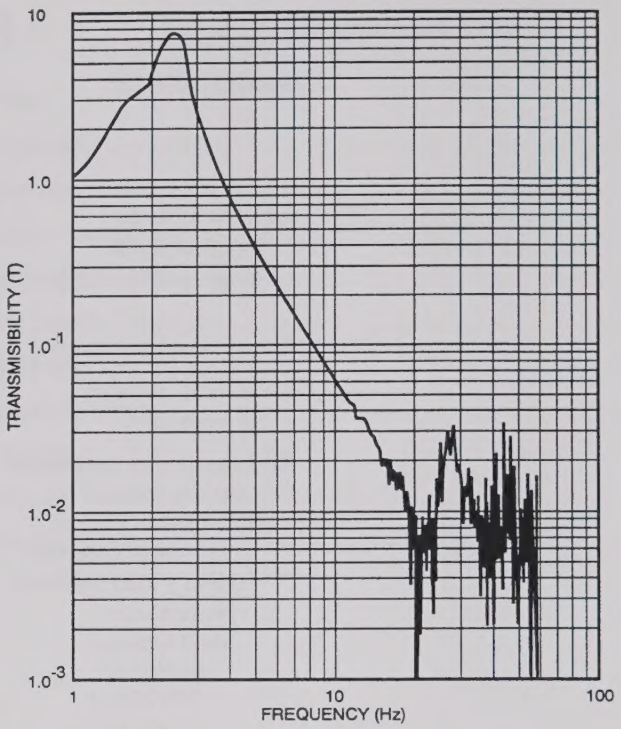
System includes:	Floor stand with independent leveling feet for each leg, three automatic leveling valves, selection of tables tops and a choice of isolators.
Isolator natural frequencies at 40 psi (2.8 kg/cm²):	Vertical: <2.5 Hz Horizontal: <2.5 Hz
Required air pressure:	75 psi (5.3 kg/cm²) at max. rated load
Maximum allowed air pressure:	125 psi (8.9 kg/cm²)
Recommended maximum operating load (in addition to top):	
Standard isolators	0–260 lb. (0–120 kg)
Heavy load isolators	120–800 lb.(55–350 kg)
No isolators	2000 lb.
Shelf loading	
(6x36 in.)	20 lb.
(10x36 in.)	35 lb.
(14x36 in.)	45 lb.
(21x36 in.)	70 lb.
Leveling feet adjustment range:	±0.375 in. (±10 mm)

Table Top Options:

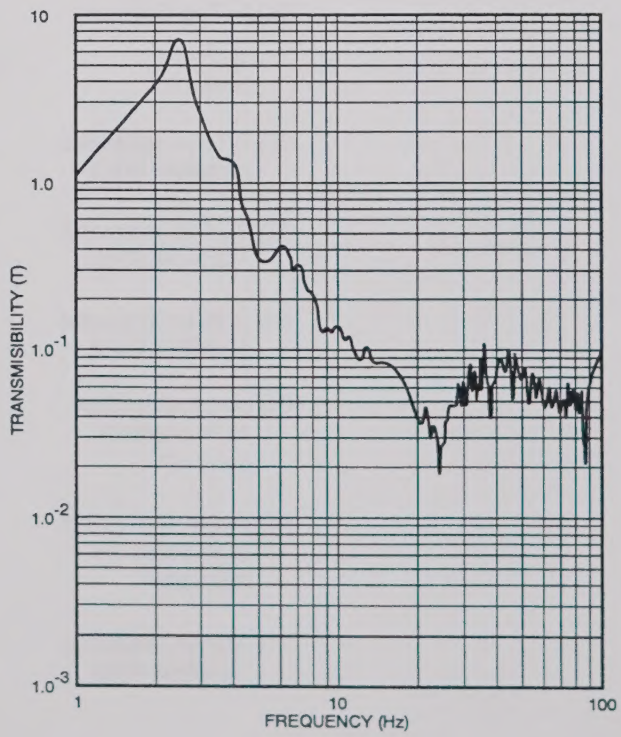
Working Surface	Core Thickness	Mounting Holes	Damping	Flatness over 2 ft.
01) 3/16 in. magnetic stainless steel	4 in.	yes (sealed)	no	±0.004 in.
02) 3/16 in. magnetic stainless steel	2 in.	yes	no	±0.004 in.
03) 3/16 in. magnetic stainless steel	2 in.	no	no	±0.004 in.
04) non-conductive high-pressure laminate	2 in.	no	no	—
05) static dissipative high-pressure laminate	2 in.	no	no	—
71) 3/16 in. magnetic stainless steel	4 in.	yes (sealed)	yes	±0.004 in.

Isolation System Transmissibility

100 lb. applied load, floor vibration less than 1μm peak to peak.



Vertical Direction



Horizontal Direction

Section 1
General Information

1.1 Introduction

The VW Series Vibration Isolated Workstation provides an ideal working platform for vibration influenced devices such as interferometers, microscopes, and balances. Sensitive instruments such as these will show significant improvements in resolution and repeatability when isolated from floor motion by the VW series pneumatic suspension system. This versatile workstation is available in a broad range of sizes, working surfaces, isolator capability, and accessory options.

Special care was taken to ensure excellent performance in the 20-50 Hz floor vibration frequency range corresponding to dominant ambient vibration frequencies, especially those common to multi-floor buildings. The modular pneumatic isolators provide excellent protection against both vertical and horizontal floor motions.

These workstations integrate Newport's rigid, laminated honeycomb panel technology and pneumatic isolation systems to provide a mounting platform which is rigid, yet thin and light weight. The system accommodates high center of gravity loads with exceptional stability. Equipped with optional casters, the system is easy to move without heavy equipment and may be safely lifted by building elevators.

It is possible to tailor the system to a wide variety of applications using the range of sizes and available working surfaces.

1.2 Getting Started

Please read and understand this instruction manual thoroughly before beginning the assembly of the VW Series Workstation. The components have been partially assembled at the factory and only require final assembly and performance adjustment tasks. A bubble level is provided to aid in leveling the system.

1.3 Unpacking and Inspection

The VW Series Workstation components have been packed in labeled boxes. Make sure the total number of delivered crates equals the total number listed on the labels. The components have also been labeled for better identification during assembly. Go over the assembly orientation diagram (figure 1.1) while unpacking and verify the presence of all ordered parts. Carefully inspect all components for any damage that may have occurred during shipping. Report any such damage to the shipping agent at once.

1.4 Safety Terms

The following safety terms are used in this manual.

The **Warning** term used in the text indicates dangers that could result in personal injury.

The **Caution** term indicates situations that may result in damage to the VW components.

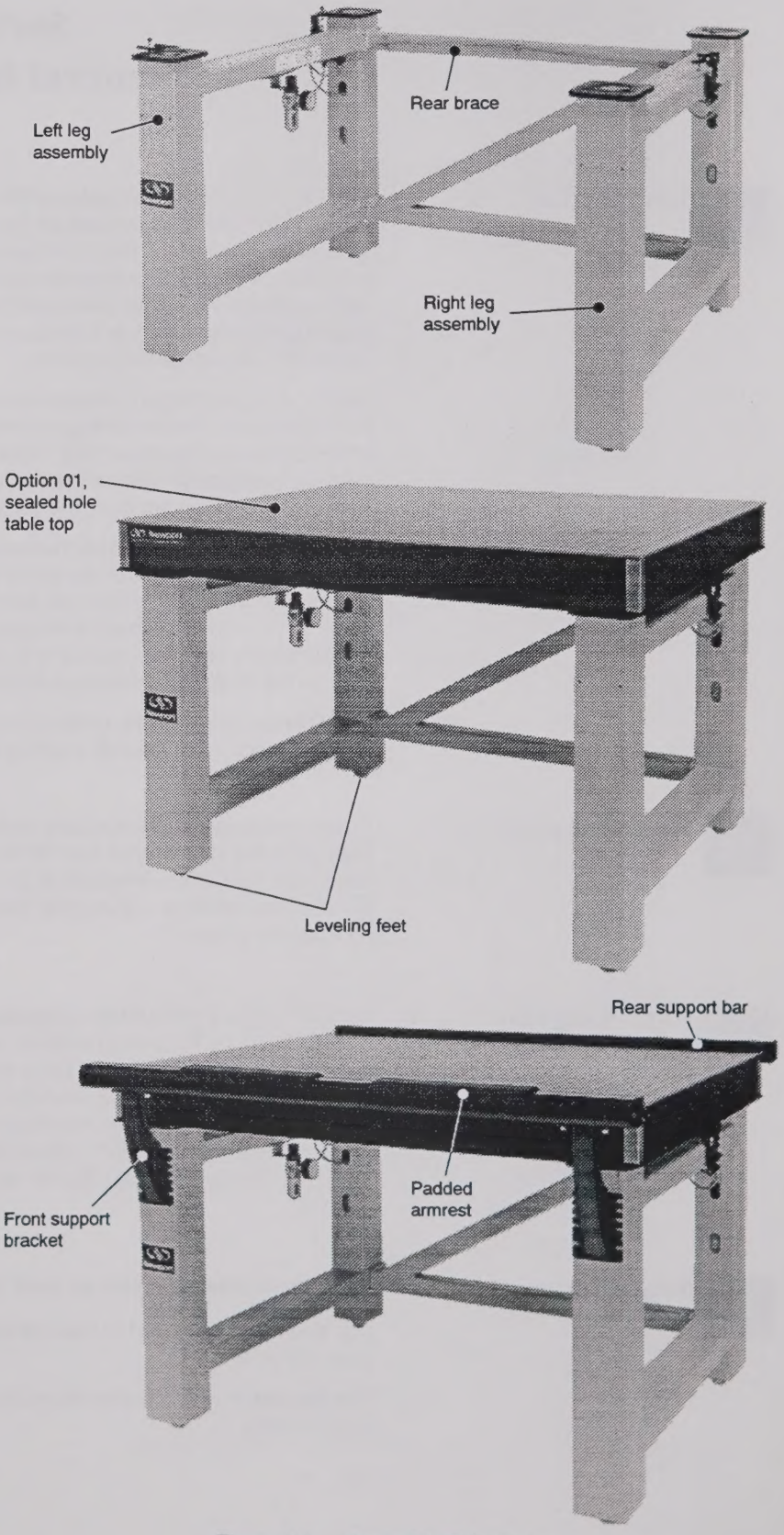


Figure 1.1 — Assembly Orientation

1.5 Workstation Placement

To ensure optimal performance from the VW Series Workstation it is necessary to consider aspects of placement. Attempt to locate the unit on as level a surface as possible. Placement on an uneven floor may make proper frame leveling more difficult. If the unit will be located on floors other than the ground floor, attempt to place it near primary vertical building structures such as exterior walls or support columns. This will minimize the possibility of lower frequency floor motion affecting the isolation performance. It is also advisable to avoid locations adjacent to major sources of floor vibration such as operating machinery.

WARNING

If installation site is susceptible to earthquakes it is recommended that the legs be securely fastened to either the floor or an adjacent wall. The shelf/armrest package is also required to provide table top restraint.

1.6 Warranty Information

Warranty information may be found on the page preceding the Table of Contents of this manual. Should it be necessary to exercise the warranty, contact your Newport representative to determine the correct course of action. Newport Corporation maintains offices in the United States and worldwide. Check the back cover of this manual for the addresses and phone numbers of these offices.

1.7 Options and Accessories

The list of shipped parts may include some of the following optional equipment depending upon your order.

Options	Option Code
Heavy load isolators	10
No isolators	11
6 in. shelf/armrest package**	20
10 in. shelf/armrest package**	21
14 in. shelf/armrest package**	22
21 in. shelf/armrest package**	23
Padded armrests and front support bar	30
Damped Table top	71
Casters	40

Accessories (ordered separately)	Model No.
Extra shelves* in. (cm)	
6x30 (15x76)	VW-S630
6x36 (15x91)	VW-S636
10x30 (25x76)	VW-S1030
10x36 (25x91)	VW-S1036
14x30 (36x76)	VW-S1430
14x36 (36x91)	VW-S1436
21x30 (53x76)	VW-S2130
21x36 (53x91)	VW-S2136
Casters	VW-C
Padded armrests*	VW-A

* Extra shelves and armrests sold as accessories do not include support bars.

** Shelf and armrest packages include:

1 Shelf	Rear Support Bar
Front Support Bar	Movable Padded armrests

Section 2
Assembly

2.1 Loose Assembly of VW Frame and Air System

2.1.1 Frame Assembly

A. Typically, all VW frames are fully assembled and tested at the factory. If this is true in your case please disregard sections 2.1.1 and 2.1.2. In some instances, overseas shipping will result in a partially unassembled frame. In this case you should follow the procedures outlined below.

B. Adjust the leveling pads on the bottoms of the legs (figure 2.1). Rotate the pads until approximately ⅜ inch (9 mm) of thread remains outside the leg.

C. If casters have been ordered, fasten them to the leg assemblies at the pre-drilled and tapped locations on the lower crossmembers (figure 2.2), placing the 1 ½" spacers between the caster and the frame. Transferring the load to the casters is accomplished by simply retracting the leveling pads into the legs once assembly is completed.

D. Layout the right and left leg assemblies along with the rear brace as shown in figure 1.1.

E. Assemble the leg units to the rear brace leaving the bolts slightly loose. If armrest support bars are included, install them to the leg assemblies. Make sure to consider the desired working height of the armrest and/or shelf with respect to the table top surface and position the support bars accordingly, also leaving the bolts slightly loose.

2.1.2 Air System Assembly

The VW Workstation is shipped with the air regulator/filter (ARF), figure 2.3, and leveling valves installed on the leg assemblies.

A. Using the gray tubing provided connect the yellow inlet fitting on the right leg assembly valve (single valve) to the "T" fitting on the left leg assembly (see figure 2.4). To connect the tubing to the fittings, insert and firmly press the tubing into the fitting. (Warning: Do not attempt to disconnect the tubing once the system is pressurize.) Route the tubing along the rear brace and secure it in position using the stick-on tubing clips.

B. Turn the ARF control knob counterclockwise all the way to the "OFF" position.

C. Use the translucent tubing provided to connect the ARF inlet to the air supply.

2.1.3 Installing the Table Top

Lift the table top and carefully set it on the frame. Use a ruler to ensure that the top is approximately centered on the frame.

WARNING

The Table top can weigh as much as 250 lbs. (114 Kgs.). It is important to ensure that adequate personnel is available when installing the table top or employ the use of a forklift or hoist.

The VW isolator pistons incorporate a self centering device (U.S. patent no. 5,071,108) which eliminates the need to manually center and verify piston position.

2.2 Squaring and Leveling the Frame

For optimum performance the VW Frame must be assembled so that the tops of the four legs are co-planer. If not, isolator travel may be limited or the frame and top may rock.

A. Adjust the four leveling pads (figure 2.1) until the table top contacts evenly on all four of the legs and does not rock when pressed down on at any of the four corners.

B. Tighten all frame and armrest support bolts.

C. Level the table top using the standard bubble level provided, or equivalent, making any necessary further adjustments to the four leveling pads.

D. Recheck that neither the frame nor the top can be rocked.

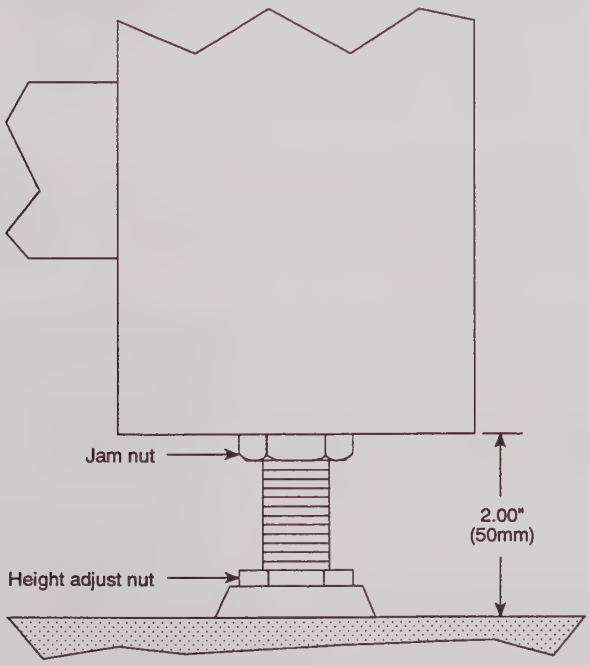


Figure 2.1 — Leveling Pad Adjustment

2.3 Isolating the Table Top

A. Position the pads on each of the three leveling valve arms so that they contact the underside surface of the table top (figure 2.5).

B. Fully close (turn clockwise), using a screwdriver, the needle valves located on the leveling valves (figure 2.6). Then open each needle valve approximately ⅛ turn for each isolator the valve supplies. i.e. the single valve at the right side of the VW controls the two right side isolators and must be opened ¼ turn.

C. Turn up the air pressure with the ARF to approximately 50 psi. Adjust the valve arm pad height until the table top is raised up (or floated) above the leg tops by approximately ⅛ inches (3 mm).

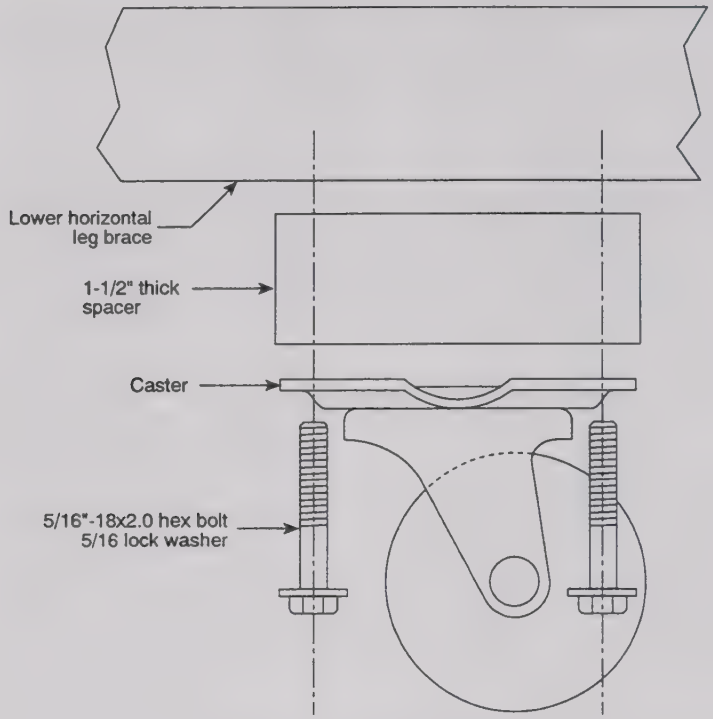


Figure 2.2 — Caster Installation

CAUTION

Do not exceed the maximum allowable system pressure of 125 psi (8.9 kg/cm2).

D. If the table top rocks back and forth (or hunts) on its own, reduce the air pressure until the system is stable or close the needle valves slightly.

E. Lift and press down each corner of the table top to ensure that the approximate ±⅛ inch (±3 mm) of desired vertical travel exists. Push the top horizontally in each axis to verify that there is approximately ±0.2 inch (+5 mm) of lateral travel. If friction or resistance to motion is encountered, examine each isolator and correct any assembly errors.

F. Once the table top is loaded to the expected working load the system air pressure should be adjusted to a level high enough so the top floats in a stable manner, relevels quickly, and maintains the ⅛ inch clearance from the leg tops.

For assistance on any of the assembly operations please contact the Newport applications staff or your nearest Newport representative at the phone numbers listed on the back of this manual.

2.4 Optional Accessories

If optional items have been ordered it is necessary to consider their installation or assembly requirements as you go through the above assembly steps. Following is a list of the optional items available and the additional assembly steps necessary to include these items to your workstation.

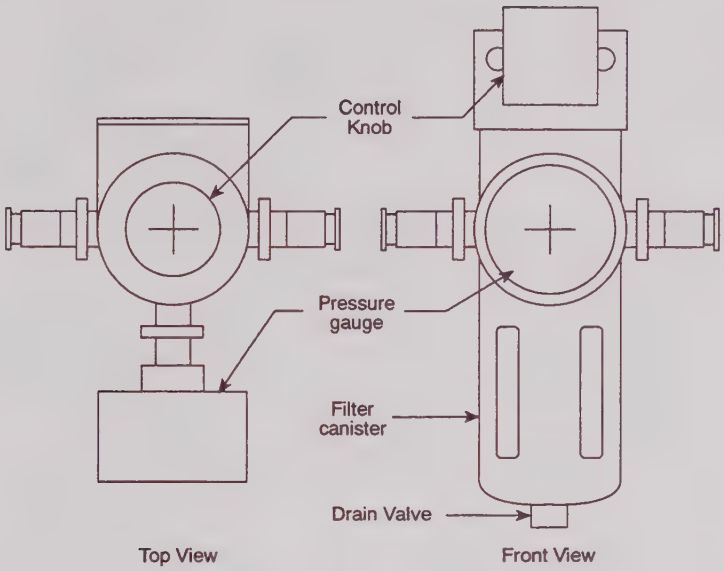


Figure 2.3 — ARF

Casters

Casters are installed before initial frame assembly as described in 2.1.1.B. If casters are being added to an existing assembled workstation it will have pre-drilled and tapped holes on the lower leg assembly crossbraces.

Armrest Support Bars

One, or two, armrest support bars may be included depending upon whether the option is for the armrest alone or for the armrest/shelf package. These are to be installed during the basic frame assembly procedure as describe in section 2.1.1.D. If an armrest or shelf system is being added at a later time, simply install at the desired working height and repeat the procedures outlined in section 2.2, Leveling the Frame.

Exchanging Isolator Modules

If an exchange is being made between the existing standard isolators and the heavy load units, it is a straight forward procedure to first remove the original and install the heavy load models.

The isolator modules are held into the legs by four 3/16" diameter x 3/8" grip length pop-rivets. The rivets are removed by drilling into the rivet head with a 3/16" drill until the head comes loose from the shank. Drive the rivet shank into the leg with a punch and hammer. The grey isolator module air tube is then unplugged (push in the colored ring on the tube fitting to release the tubing) from the damping chamber fitting and the entire isolator module can be removed from the leg. Since September, 1990, Newport has equipped all VW Workstations with laminar flow damping, single chamber, isolation systems (patent pending). This isolator system is retro-fitable to all non-isolated breadboard stands and all older model VW's with removable damping chambers. Non-removable chambers are foam sealed into the legs and are recognizable by a soft foam gasket around the two fittings at the lower leg opening. Removable chambers are removed by unscrewing the two fittings from the chamber and withdrawing the chamber from the top of the leg.

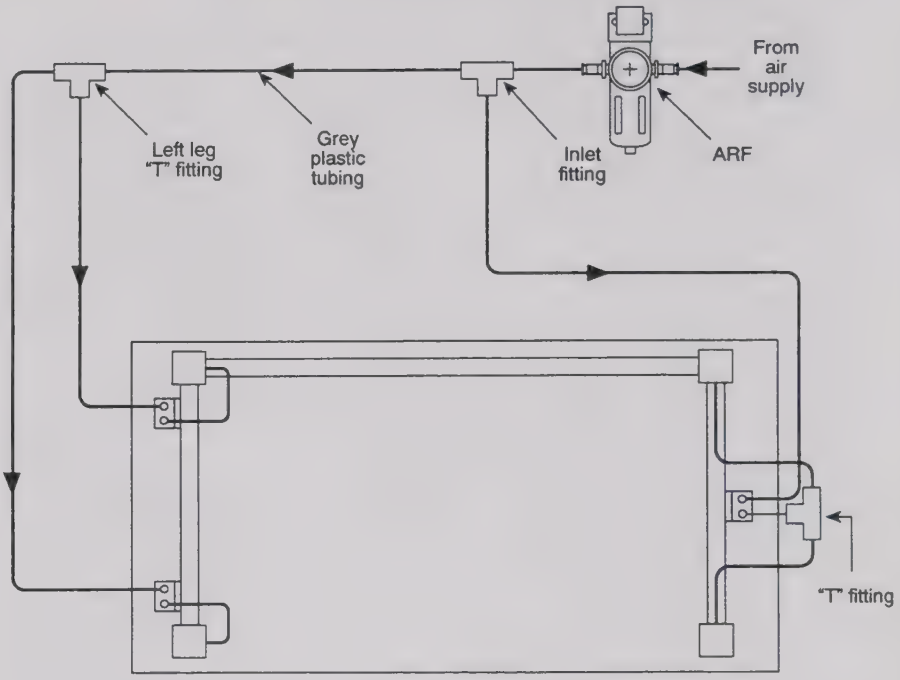


Figure 2.4 — Air System Diagram

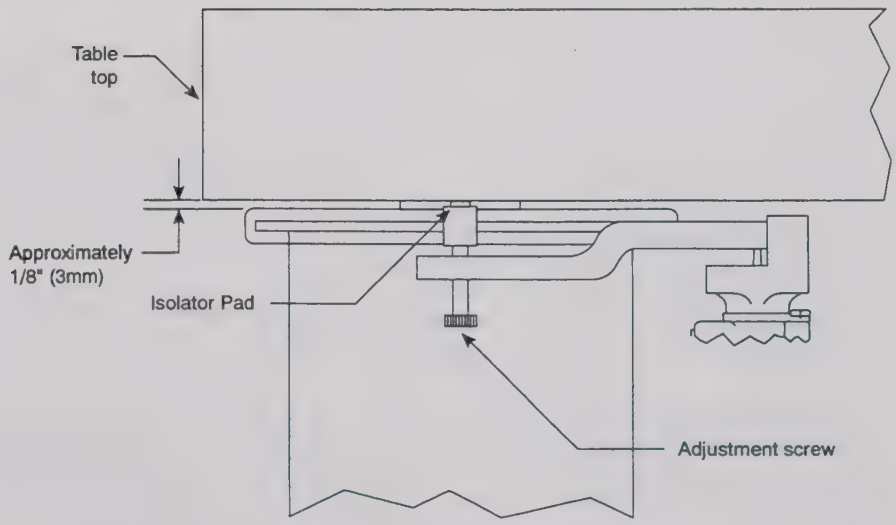


Figure 2.5 — Leveling Arm Orientation

If it is desired to retrofit an early, light duty, non-removable chamber VW with heavy load isolators, Newport can supply the necessary parts and special instructions.

The new isolator module is installed in the leg and pop-riveted into place. The isolator to leg attachment holes are keyed so that the isolators will only fit in one orientation. Place all four rivets in the holes. Pull the inside rivets first, then the outside ones. Inexpensive pop-rivets and rivet guns are

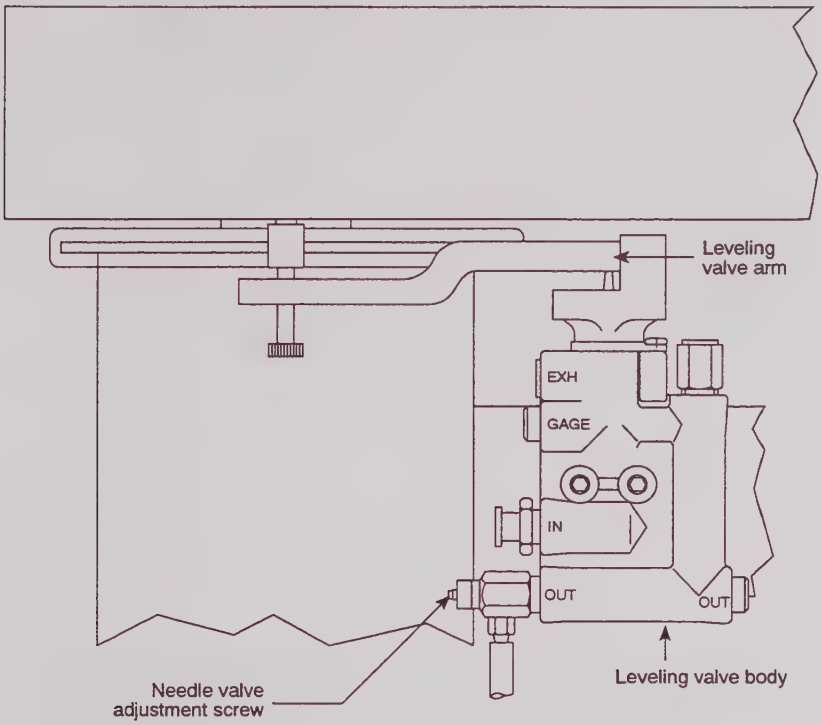


Figure 2.6 — Leveling Valve

available at most hardware stores. Cut the grey hose on each isolator to length so that it reaches from the leveling valve to the isolator without contacting the legs and attach it to the valve.

Installation of an entire isolation kit

1. Parts list.

Item	Qty	Note
Isolator modules	4	state reqd. load range
Leveling valve	3	
ARF	1	
Hardware kit	1	
Instruction/installation kit	1	

2. Installing Isolators

   2a. Remove the molded rubber ring from the top of each leg and discard.

   2b. Place the isolator modules on the leg tops. Note that the third suspension cable must be hooked into the keyhole slot in the isolator module top plate. The isolator top plate to leg attachment holes are keyed so that the isolator will only fit in one orientation. Feed the short grey tubes from the bottoms of the isolators through the upper oval cut-outs in the legs. Ensure that the isolators move freely in the horizontal direction without dragging. Ensure that the grey tubes do not contact the edges of the leg cut-outs. Pop-rivet the isolators into place as described in section 2.4.C. Stretch the rubber leg top covers into place. The hole pattern in the covers should be lined up with the isolator top plate cable retainers.

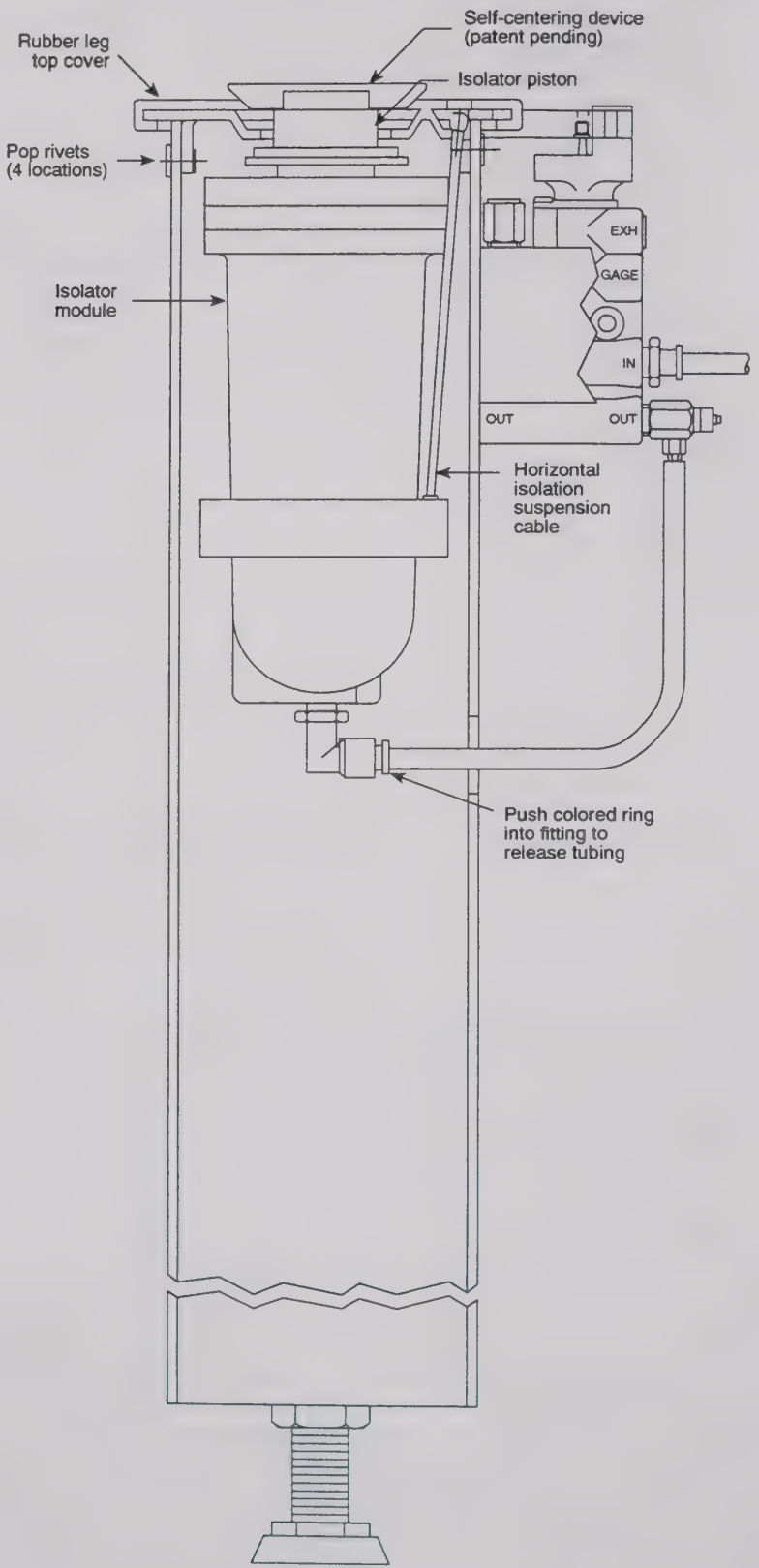


Figure 2.7 — Installing Isolator Modules

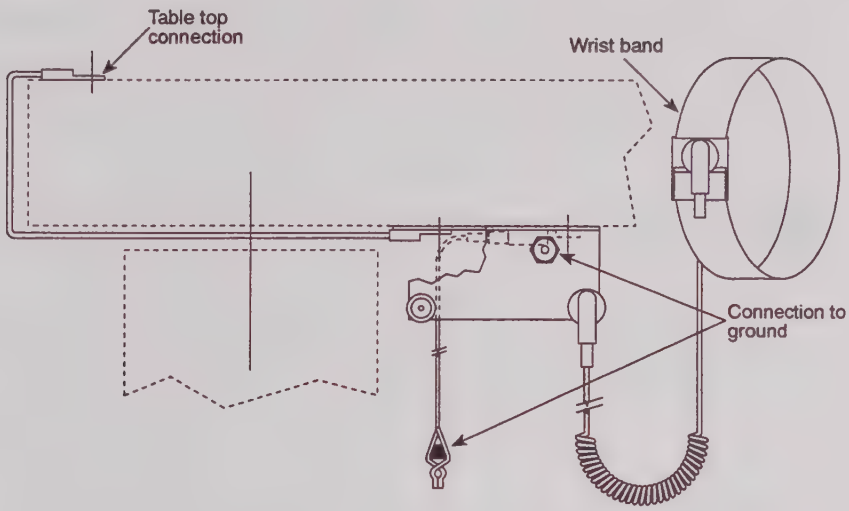


Figure 2.8 — Ground Strap Attachment

2c. Install the leveling valves and ARF as shown in figures 2.3, and 2.6. Plumb the air system with the tubing provided per figure 2.4. The grey tubing has been pre-cut to the proper lengths. Secure the tubing in place along the VW frame using the stick-on tubing clips provided.

2d. Check the system for leaks by connecting the air supply to the ARF and adjusting the pressure to 80 psi. Ensure that all leveling valve needle adjustments have been set open at least ⅛ turn. Open each leveling valve in turn by holding the leveling arms down. After 15 seconds shut off the air supply to the ARF. If the air pressure on the ARF gage falls steadily this indicates a leak in the branch of the system controlled by the leveling valve held open. Leaks may be found by applying soapy water to all connections and checking for bubbles. Fitting leaks are corrected by removing the fitting , applying sealing compound to the threads, and re-installing. Tubing-to-fitting leaks are generally caused by uneven or non-square ends on the tubing. Careful cutting of the tubing ends should remedy this problem.

2e. Turn off the air supply at the ARF. Allow the isolator pistons time to drop below the leg top covers. Proceed to install the table top as directed in section 2.1.3 and continue with the instructions given in section 2.3 for isolating the table top. For help in identifying any isolation problems see Section 4, Troubleshooting.

Static Dissipative Table Tops

Figure 2.8 indicates how to attach the special ground strap hardware to your VW if it has come with the option 05 (static dissipative) table top.

Section 3
Operation

3.1 Principles of Operation

The VW Series pneumatic isolators are one of the best methods of vibration isolation for critical applications. They are designed and constructed to provide very effective isolation of vibrations at frequencies above 5 Hz by exhibiting the "fast roll-off" characteristics of the simple harmonic oscillator. As well, they provide the low amplification at resonance (2–3 Hz) that is associated with the classic damped harmonic oscillator.

The basic design for a Newport pneumatic isolator with laminar flow damping is depicted in figure 2.9. The isolated mass M (for example, an optical table, or precision instrument such as a microscope) is supported by a piston which rests on a flexible rolling diaphragm. The diaphragm separates the piston from an air chamber called the "compliance chamber". Air flowing through the laminar flow restrictor dissipates energy, reducing the amplification of the isolator at resonance.

To achieve high performance horizontal isolation the VW design has incorporated a three point support pendulum system for each of the isolator units. This approach renders horizontal isolation performance that is comparable to that in the vertical direction and results in a work platform that will provide the highest level of isolation from unwanted vibrations in any direction.

3.2 Performance Adjustments

Once the system is assembled and the table top is floating it is possible to make minor performance adjustments to the isolation system to suit the individual users needs. This involves adjustments to the system air pressure, leveling arms, and needle valves.

A. **Stabilizing high center-of-mass loads**: Working loads on the table which have a relatively high center-of-mass (approximately ½ times the shortest table dimension above the working surface) may make the system more difficult to stabilize. Operating at a lower system pressure will improve stability and tend to reduce the rocking or hunting.

B. **Improving leveling response times:** If the system is stable, it is possible to improve the releveling response time by increasing the system pressure. This is desirable if moving components are regularly disturbing the working surface.

C. **Table loads and/or load positions changing:** Adjustments to the leveling valve arms may be required if the loads on the table are moving or changing significantly. Each time a load change is made, check the table top relationship to the leg tops and ensure that the desired ⅛ inch clearance is being maintained. If a change is noticed simply make adjustments to the overall system pressure (ARF) and/or further adjustments to the leveling arms.

D. **Fine tuning the leveling valves:** Further performance adjustments can be made by using the needle valve on each leveling valve (discussed in section 2.3.B). If faster releveling is desired open all the needle valves in ⅛ turn increments (counter-clockwise) until the required releveling time is achieved. All needle valves should always be opened the same for each isolator they control. See Section 2.3.B. If instability is more of a

concern and it is desirable to reduce the potential for the top to oscillate or hunt it is necessary to close the needle valves as much as possible, without closing them completely.

Experimentation will help determine the best settings for the needle valves, the optimal ARF pressure, and the correct leveling arm position to best serve each particular application.

3.3 Maintenance

3.3.1 Cleaning

To clean any of the optional table tops (either 400 series stainless steel or high pressure laminate) spray household cleaner, such as "409" or "Fantastic", on a clean cloth and wipe down. Avoid using abrasive cleaners since they will foul the mounting holes and also damage the laminate tops.

3.3.2 Spare parts

The following list provides the part numbers for parts or components used on the VW workstation that may at some point require replacement.

Part Name	Part No.
Leveling feet	14863-01
Leveling valves	13082-01
Air regulator/filter	ARF
Isolator modules (STD)	16700-01
Isolator modules (HEAVY)	16700-02

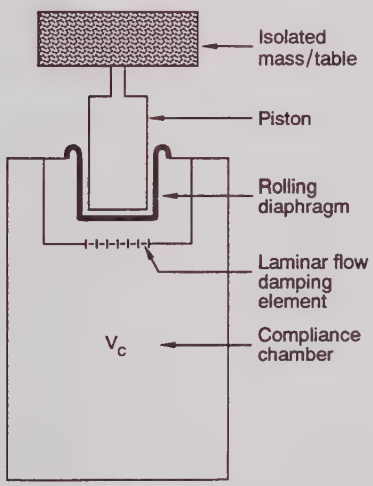


Figure 3.1 — Newport Laminar Flow Damping Isolator Design

Section 4
Troubleshooting

4.1 Poor Isolation Performance

4.1.1 Table Top Does Not Lift Up (not Floating)

A. The supply pressure from the ARF valve may be insufficient for the working load level on the table. Increase the external supply or the ARF setting until the table floats. If the ARF valve reads 75 psi and the table still has not raised off the legs check to see if the maximum load rating has been exceeded. If some corners are floating and others are not, it is necessary to make adjustments to the leveling arms in addition to possible increases in the system pressure. Large off-center loads will require higher than normal pressure to float the table. If one corner continues to be difficult to float, attempt to reposition the loads on the table to achieve a more uniform distribution as near the center as possible.

B. Another possible cause for one side, or one corner, not becoming elevated might be "over-adjustment" on the opposite side or corner. To remedy this, simply adjust the leveling arms on the corners that are floating to bring the table top down in these locations. This should then allow the opposite side to be raised up through further leveling arm and system pressure adjustments.

C. Check to see if all the air lines are connected properly and there are no air leaks.

D. Make sure the needle valves are not completely closed on the leveling valves. Turn them counterclockwise ⅛ turn if they appear to be closed.

4.1.2 Other Causes of Poor Isolation

A. Vibration may be transmitted to the table due to direct physical contact of equipment mounted on the top with external vibration sources.

B. Equipment mounted to the table may be vibrating at a resonant frequency which is disturbing other components that may be sensitive to these frequencies. Improving the rigidity of the attachment mechanism used for the components may help this situation. Otherwise, consider removing the vibration source from the table top.

C. The air line which connects to the isolator module may be rubbing against the hole it passes through in the side of the leg. It is easily recentered by reaching into the leg opening and turning the swivel tube fitting on the isolator module.

4.2 Oscillations or "Hunting"

This is a high center-of-mass stability problem and can be improved by reducing the ARF pressure and/or slightly closing the four leveling valve needle adjustments (see Section 3.2.D).

4.3 Releveling the System

If the workstation has been moved to a new location it will be necessary to relevel the frame to ensure proper performance. Obtain a standard bubble level if the original one provided cannot be located. Follow the instructions in Section 2.2 to level the frame.

4.4 Water in the Air Supply

Most compressed air systems contain some water vapor. Water may then build up in the ARF filter and prevent proper air supply to the VW. Accumulated water may be removed by pressing upwards on the stem at the bottom of the filter.

Section 5
Factory Service

5.1 Obtaining Service

To obtain information concerning factory service, contact Newport Corporation or your Newport representative. Please have the following information available.

1. Model number.
2. Purchase order number.
3. Complete description of the problem.

If components are to be returned to Newport Corporation, you will be given a Return Number, which you should reference in your shipping documents.

Please fill out the service form, located on page 17, and have the information ready when contacting Newport Corporation. Include the completed service form with any parts or components that are returned.

5.2 Service Form

Newport Corporation
U.S.A. Office: 714/863-3144
FAX: 714/253-1800

Name _____ RETURN AUTHORIZATION # _____

Company _____ (Please obtain prior to return of item)

Address _____

Country _____ Date _____

P.O. Number _____ Phone Number _____

Item(s) Being Returned:

Model # _____ Serial # _____

Description _____

Reason for return of goods (please list any specific problems) _____

_____

Please complete the below, as appropriate.

List all control settings and describe problem _____

_____

_____

_____ (Attach additional sheets as necessary).

Show a block diagram of your measurement system including all instruments connected (whether power is turned on or not). Describe signal source. If source is a laser, describe output mode, peak power, pulse width, repetition rate and energy density.

Where is the measurement being performed?

(factory, controlled laboratory, out-of-doors, etc.) _____

What power line voltage is used? _____ Variation? _____

Frequency? _____ Ambient Temperature? _____

Variation? _____ °F. Rel. Humidity? _____ Other? _____

Any additional information. (If special modifications have been made by the user, please describe below).

_____

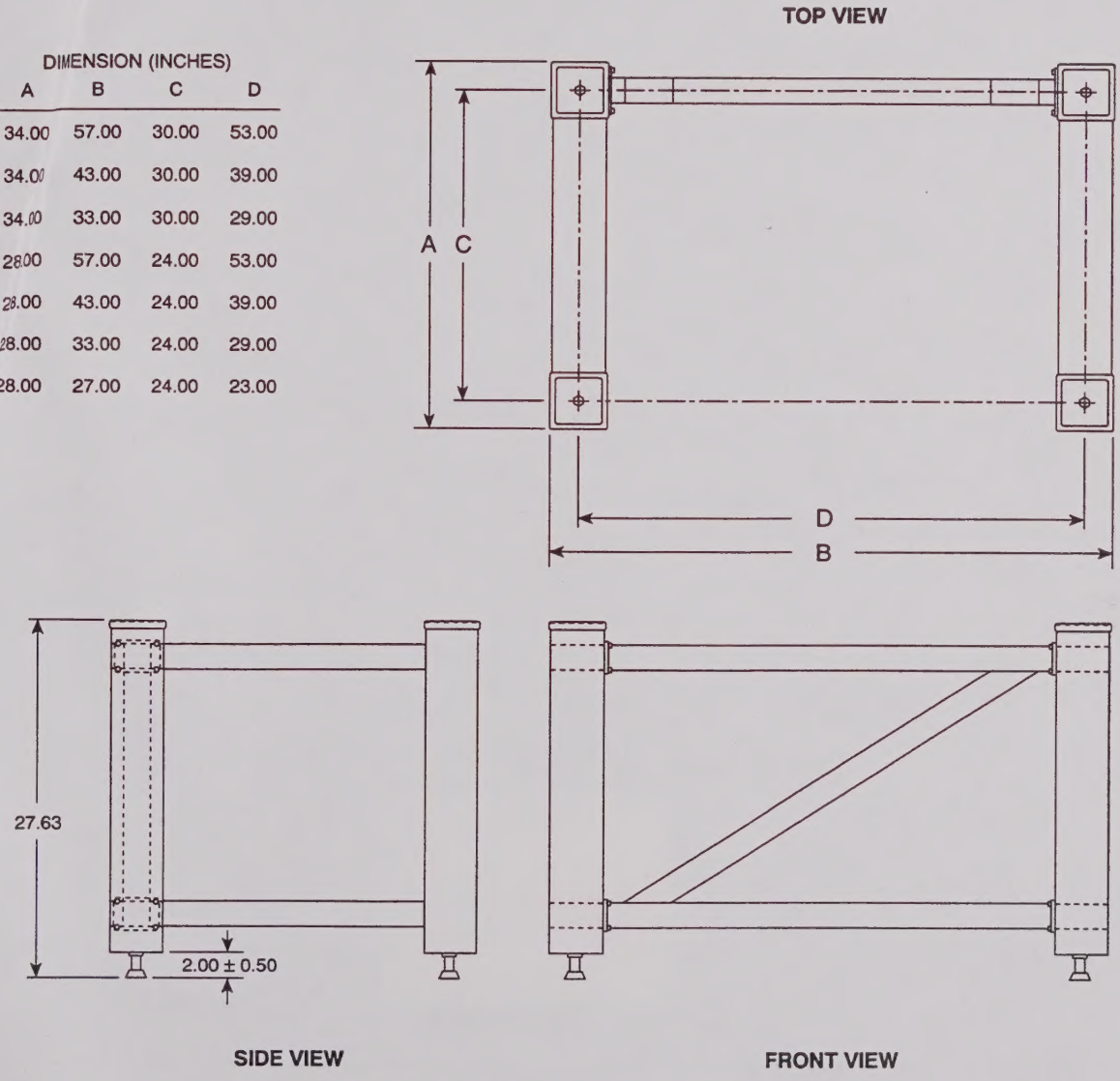
_____

_____

Section 6
Dimension Drawings

6.1 Table Frame

MODEL NO.	DIMENSION (INCHES) A	B	C	D
VW-3660	34.00	57.00	30.00	53.00
VW-3646	34.00	43.00	30.00	39.00
VW-3636	34.00	33.00	30.00	29.00
VW-3060	28.00	57.00	24.00	53.00
VW-3046	28.00	43.00	24.00	39.00
VW-3036	28.00	33.00	24.00	29.00
VW-3030	28.00	27.00	24.00	23.00



Note: Actual frame size equals breadboard width minus 2 inches times the length minus 3 inches

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1011685

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